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Title: Effective constitutive parameters of plasmonic metamaterials: Homogenization by dual field interpolation
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Source title: PHYSICAL REVIEW E
Volume: 84 Issue: 1
Publication year: JUL 29 2011
Abstract: We introduce a general implementation of the recently proposed homogenization theory [Tsukerman, J. Opt. Soc. Am. B 28, 577 (2011)] allowing one to retrieve all 36 linear constitutive parameters of any 3D metamaterial with parallelepipedal unit cells. The effective parameters are defined directly as linear relations between pairs of coarse-grained fields, in contrast with methods where these parameters are obtained from reflection and transmission data or other indirect considerations. The method is applied to plasmonic metamaterials with spherical gold particles and split-ring resonators (SRR), respectively. In both cases, the expected physical behavior is reproduced almost perfectly, with no unphysical artifacts.